

DECEMBER 2010

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TRANSFORMATION IN
ELECTRONIC AND
OPTICAL TECHNOLOGY

Secure data storage

Embedded and external data storage innovations ensure information security. **PAGE 20**

Power electronics

Smart power devices help electronic systems designers push the bounds of device size and efficiency. **PAGE 29**

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2011 Highlights

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(OPOs) are more compact, more robust, and perform better than ever before at wavelengths up to about 4 microns. New diode and fiber laser products also offer solutions at shorter wavelengths where QC lasers cannot operate. Are these technologies competitive or complementary to each other? Which has the best opportunity for growth in the near future?

FORUM PANELISTS



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ADS-B In brings ATC elements to the cockpit

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Get ready for an eventful 2011

We're on the doorstep of what promises to be an interesting 2011 for the aerospace and defense electronics industry. Prospects for increases in defense spending are bleak, Congress and the Obama Administration are girding for a year of epic battle, and aerospace and defense companies are repositioning themselves for some of the few remaining lucrative pockets of technology development—most notably wearable infantry electronics and sensor payloads for unmanned vehicles.

Oh, and something else. The PennWell Aerospace & Defense Media Group, which consists of *Military & Aerospace Electronics* and its sister electronic publication *Avionics Intelligence*, has a new publisher, and we are setting a course for dramatic improvements in the depth and breadth of our online content, while redefining our flagship *Military & Aerospace Electronics* print magazine to be of vital use in the year of turmoil ahead.

President Obama will submit his first real budget request for the U.S. Department of Defense (DOD) within the next few months—the last DOD request for fiscal 2011 essentially was the last from former President George W. Bush. Obama's 2012 DOD request will provide the first clear indications of where his administration expects to take U.S. military power and

technology over the long term.

Yet even before Obama is able to submit his request, a Republican majority in the U.S. House of representatives will take control of the lower house, and the Democrat majority in the Senate will have been markedly diminished, setting the stage for a long string of conflicts between legislative and executive priorities for U.S. military spending.

A Republican majority in the House, however, likely does not mean a reprieve for growth in the defense budget—far from it.

The freshmen Republicans who will take their seats in the House of Representatives next month are not the kinds of neo-conservatives who have been some of the most vocal and influential champions of growth in defense spending. This new breed of Republican representative, on the contrary, springs from what we know as the Tea Party, and these folks are serious fiscal conservatives—in defense spending, as well as most other federal spending.

The Pentagon has seen a decade of budget growth, and that's about to change. The political forces gathering to trim back the DOD budget, along with overall federal spending, are formidable. Unlike what we've seen in recent years, these forces will exert pressure from the right

and left of the political spectrum for defense budget cutbacks.

The left, personified by President Obama and his administration, will press for defense reductions on principle, while the right, personified by the incoming Tea Party Republicans, will push hard for fiscal federal spending restraint across the board; defense spending is unlikely to be spared.

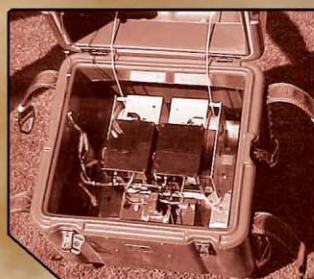
Proponents of growth in the defense budget will have few seats at the table this time around, and where the final numbers fall is anyone's guess. The smart bet, however, is on noticeable reductions.

Does that mean doom and gloom for our industry? Probably not. Those with the most to worry about are the prime defense contractors that are heavily invested in new programs that face elimination or cuts. Still, the military is not going away, and tight budgets present opportunities for systems upgrades and technology insertion. Purveyors of embedded computing, sensors, software, and the like should have plenty of opportunities.

Now back to our new publisher, Ernesto Burden. Look for big improvements to the online presence of *Military & Aerospace Electronics* and *Avionics Intelligence*. We're about to move to the next level. ↵

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news

Army approaches industry on technologies to provide national defenses against EMP attack

BY JOHN KELLER

ADELPHI, Md.—U.S. Army researchers are sending out feelers to the U.S. defense industry to locate companies with capabilities and experience to design defenses against the effects of electromagnetic pulse (EMP)—a byproduct of an above-ground nuclear explosion.

An EMP attack has the potential to kill the electronic power grid and all modern electrically powered devices over large areas, and threatens to shut down electrical lighting, computers, telephone networks, bank ATMs, factories, motor vehicles, and electric appliances for periods ranging from weeks to more than a year. An EMP attack in space could kill orbiting satellites and cripple global communications.

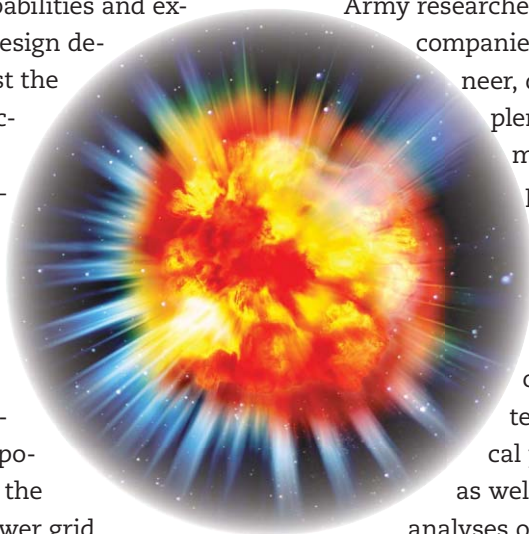
The Army Research, Development, and Engineering Command (RDECOM) in Adelphi, Md., issued a source-sought notice (W911QX11R000) to industry in an effort to locate companies with EMP-protection experience to participate in a future EMP-hardening

initiative called High Altitude Electro Magnetic Pulse (HEMP) and its Hardening Protection Countermeasures.

Army researchers want to find companies able to engineer, design, and implement countermeasures to protect against high-altitude EMP and its effects on communication and/or satellite systems and electrical power systems, as well as conduct analyses of EMP threats to crucial military and civil infrastructure and recommendations to mitigate all vulnerabilities discovered.

Seeking EMP countermeasures experts in industry are officials of the Army Research Lab Sensors and Electron Device Division (SEDD) in Adelphi, Md. Companies that get involved in this project may be asked to work in various locations on the Mid-Atlantic, as well as in Alaska, Europe, and the Asia Pacific region, Army researchers say.

Contractors chosen for the program also may have experience in



IN BRIEF

F-35 begins flying with Block 1 software

Block 1 avionics software on the Lockheed Martin F-35 Lightning II joint strike fighter has entered flight testing on an F-35 test jet. Block 1, the first of three principal software-development blocks for the F-35's mission systems, made its inaugural flight in the F-35B short takeoff/vertical landing (STOVL) aircraft known as BF-4. The Block 1 software will enable most of the primary sensors on the F-35. It forms the foundation of all subsequent software blocks. Block 1 also enables information fusion from the F-35's radar, electronic warfare system, distributed aperture system, electro-optical targeting system, and other sensors, and provides initial weapons-release capability.

F-15Cs with upgraded radar arrive at U.S. Air Force's Kadena Air Base

Boeing has delivered four F-15C jet fighters upgraded with the APG-63(V)3 active electronically scanned array (AESA) radar to Kadena Air Base, Japan. The upgraded radar is 50 times more reliable than the mechanically scanned antenna it replaces. The APG-63(V)3 radar is the

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Raytheon to design advanced air-to-air missile with multi-mode seeker for manned aircraft and UAVs

BY JOHN KELLER

ARLINGTON, Va.—Engineers at the Raytheon Co. Missile Systems segment in Tucson, Ariz., are developing a high speed, long-range air-to-air missile able to shoot down high-performance aircraft, cruise missiles, and air defense targets under terms of a \$21.3 million contract from the U.S. Defense Advanced Research Projects Agency (DARPA) in Arlington, Va.

The contract is for the DARPA Triple Target Terminator (T3) program to develop the T3 advanced air-to-air missile that would be car-

ried internally on stealth jet bombers, the F-35 Joint Strike Fighter, or the Boeing F-15-SE Silent Eagle, as well as externally on conventional jet fighters, bombers, and unmanned aerial vehicles (UAVs).

For the T3 program, Raytheon experts will concentrate on the program's prime enabling technologies, including propulsion, multi-mode seekers to defeat countermeasures, data links, digital guidance and control, and advanced missile warheads.

DARPA officials say the future T3 missile will be designed to enable

any aircraft to switch rapidly between air-to-air and air-to-surface capabilities. T3's speed, maneuverability, and network-centric capabilities would improve U.S. aircraft survivability and increase the number and variety of targets that could be destroyed on each sortie.

Raytheon will do the work in Tucson, Ariz., and Gainesville, Va., and should be finished with this phase of research and development by October 2011. ◀

FOR MORE INFORMATION visit www.raytheon.com/businesses/rms.

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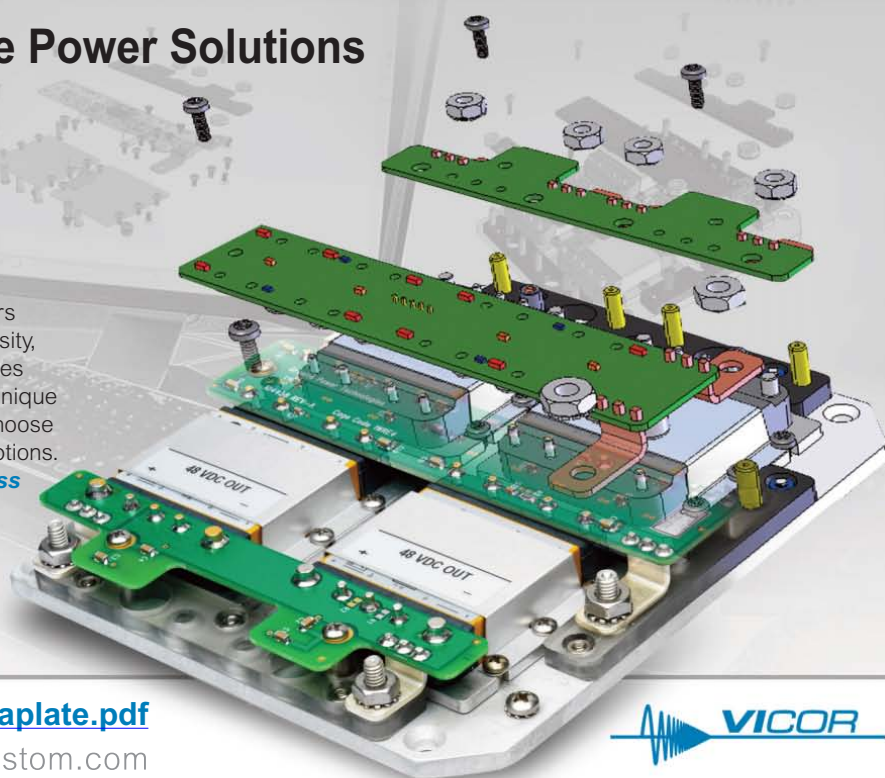
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Hybrid electric drive propulsion system for U.S. Navy surface warships takes another step toward deployment

BY JOHN KELLER

FITCHBURG, Mass.—The DRS Technologies Inc. Power Technologies facilities in Fitchburg and Hudson, Mass., have taken another step in testing and deploying a hybrid electric drive propulsion system for U.S. Navy surface warships, which experts say holds the potential to save thousands of barrels of fuel per ship each year.

DRS engineers have completed assembly and component testing of the company's Hybrid Electric Drive (HED) permanent-magnet motor, a key element of a prototype hybrid electric drive system for the U.S. Navy's Arleigh Burke-class (DDG 51) destroyer, the company announced.

DRS, a Finmeccanica company, is teaming with General Atomics in San Diego to provide the proof-of-concept HED system under a contract awarded by the Naval Sea Systems Command (NAVSEA) in July 2009.

This latest developmental milestone clears the way for integrating and testing the permanent magnet motor with the HED system converter—also built by DRS—at the DRS Power & Controls Technology segment in Milwaukee. Integrated full-load testing of the system, including control interfaces, subsequently will be at the General Atomics facility in Tupelo, Miss.,

before being delivered to the Navy's land-based engineering site in Philadelphia, where the Navy will test it next spring.

Navy and industry experts will install the hybrid electric drive



A hybrid electric ship propulsion system will be installed on the guided missile destroyer USS Truxtun (DDG 103), shown above, for an at-sea demonstration in 2012.

system on the guided missile destroyer USS Truxtun (DDG 103) for an at-sea demonstration in 2012.

This hybrid electric drive will power the ship at low speeds by integrating the permanent magnet motor with the ship's main reduction gear, which will enable the vessel to reduce the operating hours of its primary gas turbine power plant. ←

FOR MORE INFORMATION visit DRS online at www.drs.com, General Atomics at www.ga.com, or Naval Sea Systems Command at www.navsea.navy.mil.

Demand for counter-IED technology expected to decline after hitting peak of \$7.7 billion in 2009

BY JOHN KELLER

LONDON—Global demand for aerospace and defense systems able to detect, map, and destroy improvised explosive devices (IEDs) is expected to decline over the next decade after hitting a peak of \$7.7 billion in 2009, although the counter-IED market still will retain a high value because of the importance of dealing with roadside bombs and other kinds of IEDs, say analysts at market researcher Visiongain in London.

Demand for IEDs over the next decade will decline from the high levels of 2009 U.S.

and allied withdrawal from Iraq and the imminent drawdown in Afghanistan, Visiongain analysts predict in the report, "The Counter-IED Market 2010-2020: Systems and Technologies for Force Protection."

The U.S. has by far spent the most in counter-IED systems, and major Western-allied powers like the United Kingdom, Canada, and Australia have followed suit in investing heavily in counter-IED systems, Visiongain analysts say. Countries like India, which faces its own terrorist groups who are using increasing numbers of IEDs, also are likely to become key markets in the future, analysts say.

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IEDs are responsible for thousands of deaths of military personnel and civilians. The U.S. and its allies have responded to the IED threat by spending billions of dollars on vehicles, equipment, personnel, and training for counter-IED and explosive ordnance disposal (EOD) missions.

Visiongain's report analyzes the global market for mine-resistant vehicles and electronic countermeasures mainly in jammers, IED detection equipment, and unmanned systems designed for counter-IED, as well as examines



Improvised explosive devices (IEDs) have been one of the biggest threats to U.S. military personnel in Iraq and Afghanistan. Spending has peaked for counter-IED technology, and is expected to begin a slow decline.

corporate announcements and news accounts, policy documents, reports of relevant contracts, and original expert views from industry. ←

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DARPA asks QinetiQ to design unmanned surface vessel able to detect and track quiet enemy submarines

BY JOHN KELLER

ARLINGTON, Va.—Anti-submarine warfare (ASW) experts at the U.S. Defense Advanced Research Projects Agency (DARPA) in Arlington want to develop an unmanned surface vessel able to track quiet enemy diesel-electric submarines worldwide in nearly all environmental conditions. They are finding their solution at QinetiQ North America Technology Solutions Group in Waltham, Mass.

DARPA awarded QinetiQ a \$2 million contract for the first phase of the Anti-Submarine Warfare Continuous Trail Unmanned Ves-

sel (ACTUV) program to develop a first-of-its-kind unmanned naval vessel for theater or global independent deployment that is optimized to provide continuous overt trail of threat submarines.

This unmanned ASW surface vessel will operate under a sparse remote supervisory command-and-control model, with a shore-based supervisor providing high-level mission objectives and monitoring autonomous performance through an intermittent beyond-line-of-sight communications link.

The ACTUV will be able to navigate safely at sea according

to maritime law, as well as to international regulations for avoiding collisions at sea. Not only will the vessel be able to navigate by itself around the world in all kinds of ocean conditions, but it also will be able to employ its sensor suite autonomously and carry out appropriate tactics based on target behavior environmental conditions.

In particular, the ACTUV system will be able to operate on long deployments with no underway human maintenance or repair, unlike current unmanned surface vessels, which are launched and recovered from manned ships, teleoperated from manned ships, and are limited to direct support of manned ship missions.

The program is architected to achieve three primary objectives, DARPA officials say: design, build, and demonstrate an X-ship on which no person steps aboard at any time during operations; show the technical viability of an independently deploying unmanned naval vessel under sparse remote supervisory control; and combine the unmanned surface vessel with a suite of sensors capable of tracking quiet modern diesel electric submarines.

This is the first part of a four-phase program. Phase 2 will involve integrated hardware-in-the-loop testing, phase 3 will fund construction of an integrated prototype vessel and initial sea trials, and phase 4 will involve mission-oriented sea trials. ←

FOR MORE INFORMATION visit QinetiQ Technology Solutions Group online at www.qinetiq-na.com/tsg, or DARPA at www.darpa.mil.



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ARMY CONTINUED FROM PAGE 6

building pulse current injectors for transient electromagnetic (EM) effects and/or pneumatic control systems. Companies interested also should be able to design and build retrofits to 10 to 20 existing structures, as well as two existing structures to shield against the effects of EMP.

In addition, the contractor should be able to build pulse current injectors, and have knowledge of MIL-STD-188-125 for fixed facilities and transportable structures is beneficial.

If Army researchers move forward with this program, the value of potential contracts could be worth as much as \$7 million over five years, officials say.

Army officials caution that this source-sought notice is not a request for proposals or a guarantee of a future solicitation to industry. ←

FOR MORE INFORMATION visit <http://www.fbodaily.com/archive/2010/10-October/29-Oct-2010/FBO-02317450.htm>.

IN BRIEF

latest in a series of planned upgrades. These include a fighter-to-fighter data link, GPS navigation, and the Joint Helmet Mounted Cueing System, which enable the warfighter to conduct network-centric operations while employing the latest air-to-air weapons. The newly arrived F-15Cs will join the APG-63(V)1 and (V)2 aircraft already in the 44th and 67th fighter squadrons to provide combat power for the defense of Japan. The upgrades were installed and tested at Langley Air Force Base, Va. Boeing is under contract to fully upgrade 27 Air Force and 18 Air National Guard F-15C/D aircraft with the APG-63(V)3 AESA over the next 10 months. A total of 54 AESA-equipped F-15C/Ds are scheduled to be on station at Kadena by September 2013.

CONTINUED ON PAGE 13 →



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Intelligence gathering in the cloud: Data Tactics wins Army cloud computing data mining contract

BY JOHN KELLER

ABERDEEN PROVING GROUND, Md.—U.S. Army intelligence experts needed a cloud-based computer architecture

to extract and mine objects, events, and relationships from several intelligence sources—including full-motion video, audio, imagery,

financial data, signals intelligence, and all source reporting. They found their solution at Data Tactics Corp. in Alexandria, Va.

Data Tactics won a \$24.8 million contract to provide the Army with military cloud computing capability for intelligence gathering and analysis with these capabilities. Awarding the contract are officials of the Army Communications-Electronics Command (CECOM) Contracting Center at Aberdeen Proving Ground, Md.

Cloud computing works over the Internet to provide software and information to computers as they need these resources—often as Web-based tools or applications that users can access and use through their Web browsers, similarly to how they use programs installed on their own computers. A major benefit of cloud computing is the ability it provides to IT managers to expand computer and software resources to users based on current demand.

Data Tactics specializes in enterprise architecture, cyber security, engineering, system/software development, data/system integration, and operations & maintenance (O&M)/sustainment, and identifies, resolves, and supports complex computer data, storage, security, and systems problems.

Data Tactics will do the work in McLean, Va., and should be finished by the end of September 2011. ←

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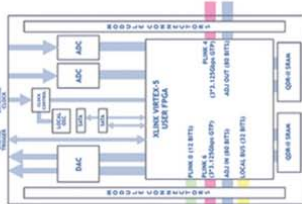
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IN BRIEF

► **Energy weapon contract goes to Lockheed Martin**

Lockheed Martin Missiles and Fire Control in Orlando, Fla., won a \$230,000 U.S. Air Force contract to define requirements for a weapon that uses high-power microwave energy beams instead of explosives to take out enemy electronic systems. The Non-Kinetic Counter Electronics Capability (NKCE) contract will lead to a new type of weapon that will destroy electronic equipment without endangering personnel. The contract, by the U.S. Air Force Air Armament

Center at Eglin Air Force Base, Fla., calls for the development of an operations concept for the NKCE system, along with a mission planning strategy. Lockheed Martin will deliver its findings to the U.S. Air Force in the first quarter of 2011. When fielded, the weapon would require an aerial delivery platform for operational flexibility and the ability to engage multiple targets per mission. The system would be aimed at structures containing identified electronic equipment that high-power microwave bursts would render useless.

► **Aegis production contract awarded to Lockheed Martin**

The U.S. Navy awarded Lockheed Martin Missiles and Fire control a \$97 million contract for the production of the Aegis Weapon System for the DDG-113 destroyer, and advanced procurement funding for two additional systems for DDGs 114 and 115. The contract includes four Aegis multimission signal processors—three for the destroyers and one for the Navy's Surface Combat System Center on Wallops Island, Va. An option for an Aegis Ashore system is included. ◀

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SPECIAL REPORT

ADS-B In brings air traffic control elements to the cockpit



Air traffic management for commercial aviation now is radar-based and managed by ground controllers, but the Federal Aviation Administration and industry are ushering in a next-generation air transport system that relies on satellites to enable air traffic control capabilities on the flight deck.

BY **John McHale**

Air traffic control (ATC) radar—the primary tool for managing air traffic in the United States—will be replaced over the next decade by a satellite-based navigation system called Automatic Dependent Surveillance–Broadcast (ADS-B). The radar systems themselves will still be available as backup for air traffic controllers, but the U.S. Federal Aviation Administration (FAA) in Washington requires aircraft flying in controlled airspace by 2020 to broadcast

their positions though ADS-B.

“This rule gives the green light for manufacturers to begin building the onboard equipment that will allow our air traffic controllers to know where aircraft are with greater precision and reliability,” says FAA Administrator Randy Babbitt. “That is one of the key elements of NextGen that will improve the safety and efficiency of flight.”

ADS-B avionics essentially will enable the aircraft to monitor its position in relation to other aircraft



UPS saved about 250,000 gallons of fuel a year, gained a 30-percent reduction in nitrous oxide emissions, and a 34-percent reduction in noise emissions, making continuous descents with SafeRoute ADS-B In technology from ACSS. The inset shows an ACSS SafeRoute merging and spacing image as seen on a cockpit display.

more accurately than they can today by using satellite navigation through the Global Positioning System (GPS), says Adam Evanschwartz, principal

marketing manager of commercial systems at Rockwell Collins in Cedar Rapids, Iowa.

What is ADS-B?

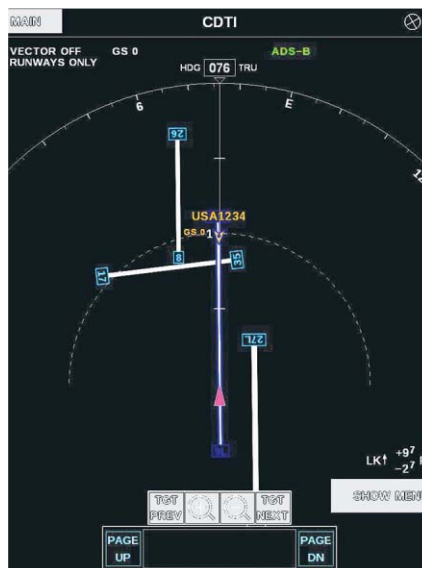
ADS-B has many applications but its main purpose is to enable an aircraft to determine its position using satellite navigation and then broadcast the position—along with its altitude, speed, heading, call sign, and aircraft type—automatically to other aircraft and to air traffic control.

By 2020, the FAA will require ADS-B Out equipment for aircraft flying in airspace including Classes A, B, and C, around busy airports and above 10,000 feet. The nationwide rollout of ADS-B ground stations will be complete in 2013.

ADS-B Out is the information broadcast by the aircraft to ground control stations, which then relay the aircraft position data via radios from ITT Corp. in White Plains, N.Y., to air traffic control stations. This technology was already being implemented by ITT on the ground.

The ADS-B information is broadcast on the 1090 megahertz spectrum and is compatible with the transponders used for traffic alert and collision avoidance systems (TCAS), Stone says. For the general aviation community, the ADS-B data link is 978 MHz, often called the Universal Access Transceiver (UAT) link.

The first test site for ADS-B technology was Alaska under an FAA project called Capstone. According to an FAA release, hundreds of general aviation aircraft were equipped with ADS-B avionics and ground-based infrastructure enabling pilots to see where they were in relation poor weather rough terrain. The fatal accident rate was cut nearly in



In this moving map display from ACSS, "ownership" is stopped on the runway. Another aircraft is "position and hold" on the other end of the same runway. In this case, the crew gets a runway status indication highlighting the runway in blue. This would precede a caution or warning.

half for the ADS-B-equipped aircraft, according to the FAA release.

ADS-B In

Where pilots will see the most improvements is with ADS-B In, which refers to the reception by aircraft of ADS-B data. ADS-B In is in contrast with ADS-B Out, which is the broadcast by aircraft of ADS-B data. ADS-B In will enable flight crews to view the airspace around them in real time.

ADS-B In essentially will reduce the workload for controllers and the flight crew, explains Cyro Stone, the ADS-B/SafeRoute programs director at Aviation communication & Surveillance Systems (ACSS) in Phoenix, a joint venture company of L-3 Communications & Thales. It brings

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greater situational awareness to pilots than they have today by providing traffic information to the pilot's display updated continuously in real time—whether on a primary flight display or an electronic flight bag (EFB). “It does not eliminate the need for air traffic controllers,” Stone emphasizes.

Among the advantages of ADS-B

In is helping to reduce aircraft fuel consumption and noise by enabling continuous-descent approaches, as opposed to the traditional stair-step downward approach to airports that aircraft take today, Stone says. During a stair-step approach to landing, aircraft alternately descend, and then level off by accelerating engine speed, which wastes aviation fuel

and creates more noise.

Air traffic control typically directs non-ADS-B aircraft to level out periodically so they can maintain their positions relative to other aircraft, Stone continues. With ADS-B In technology the flight crew can see their aircraft's position on their cockpit displays continually in relation to other aircraft, and

FAA clears ITT-deployed ADS-B system cleared for nationwide rollout

ITT Corp. in White Plains, N.Y., received clearance from the U.S. Federal Aviation Administration (FAA) for nationwide deployment of the satellite-based air traffic surveillance system, Automatic Dependent Surveillance—Broadcast (ADS-B). ITT provides radios, routers, and radio control stations for the program. This means that air traffic controllers can now more accurately separate aircraft in the U.S. with ADS-B coverage by displaying aircraft tracked through the new ADS-B global positioning technology, as well as displaying traditional radar monitoring.

Benefits include more accurate information and more rapid updates than current systems, says John Kefaliotis, ITT's vice president of next-generation transportation systems. “We will be able to deploy surveillance where never before, such as on oil platforms,” he says.

Since 2007, ITT has been under contract to the FAA to deploy the ADS-B ground infrastructure in support of the FAA's overall Next Generation Air Transportation System (Next-Gen) initiative to modernize the U.S.

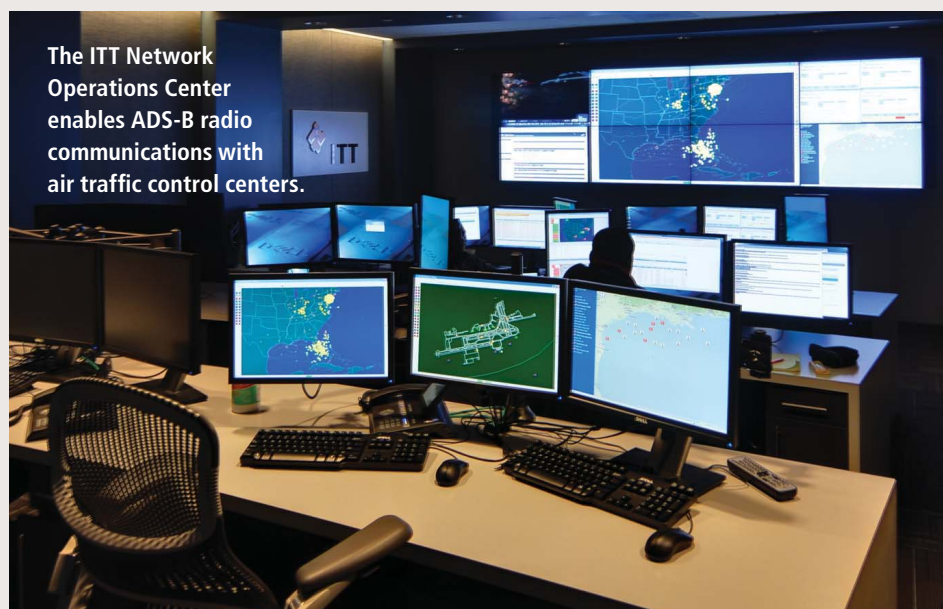
National Airspace System.

Commissioning the system follows ADS-B implementation by ITT at four sites in Alaska, the Gulf of Mexico, Louisville, Ky., and Philadelphia. The “ADS-B technology we provided for these four sites is for critical services, also known as surveillance services, Kefaliotis says. Critical means critical to air traffic control, he adds.

The next step involves essential services, which cover Traffic Information Services—Broadcast (TIS-B)

and Flight Information Services—Broadcast (FIS-B). TIS-B provides air traffic situational awareness from ground sources, such as radar, and FIS-B provides information, such as weather reports.

For this program, test sites were determined due to the variety of operational environments and challenges, Kefaliotis says. Technology was then deployed to the test site, and then it was evaluated and approved for nationwide deployment, Kefaliotis says.



SPECIAL REPORT

can maintain separation without air traffic control assistance during continuous descents. This also will help reduce vectoring problems at airports, Stone adds.

ADS-B In displays

Standards for displaying ADS-B In information on cockpit avionics or EFB are still being

formulated, and as a result, companies designing ADS-B In solutions take different approaches, says Chad Cundiff, vice president of crew interface systems at Honeywell Aerospace in Phoenix. As of yet, there is not an ADS-B In mandate from the FAA as there is for ADS-B Out, says Rockwell Collins's Evanschwartz.



Pictured is an ITT ADS-B ground station in Boca Raton, Fla.

The ADS-B radios

"We've got 300 radio stations completed and will have 800 by 2013," when the program is complete, Kefaliotis says. The radios provided by ITT are not commercial off-the-shelf (COTS). They were designed with stringent FAA requirements for receiving airborne data reports, he adds. ADS-B radios are less expensive than radar radios.

The radios operate on a frequency of 1090 MHz, which was allocated for this radio, Kefaliotis continues. ITT's radio architecture enables the radios to distribute information to any ATC facility, he says. ITT has three major radio control systems set up nationwide to enable the network—Ashburn, Va., Dallas, and Redwood City, Calif.

The radio control stations provide central processing and data distribution services, he says. Some installations will have backup radar control but some will not, he notes. For those aircraft not equipped with ADS-B, the ATC facilities can merge ADS-B data with radar data, creating a TIS-B capability, Kefaliotis says.

ITT's ADS-B team includes: AT&T, which provides the network; Thales, which provides the radios and multisensor tracker; WSI, the weather service provider; Sunhillo, which provides the service delivery point (SDP) equipment; Pragmatics, which provides software development support; and SAIC, which provides engineering and implementation support. ←

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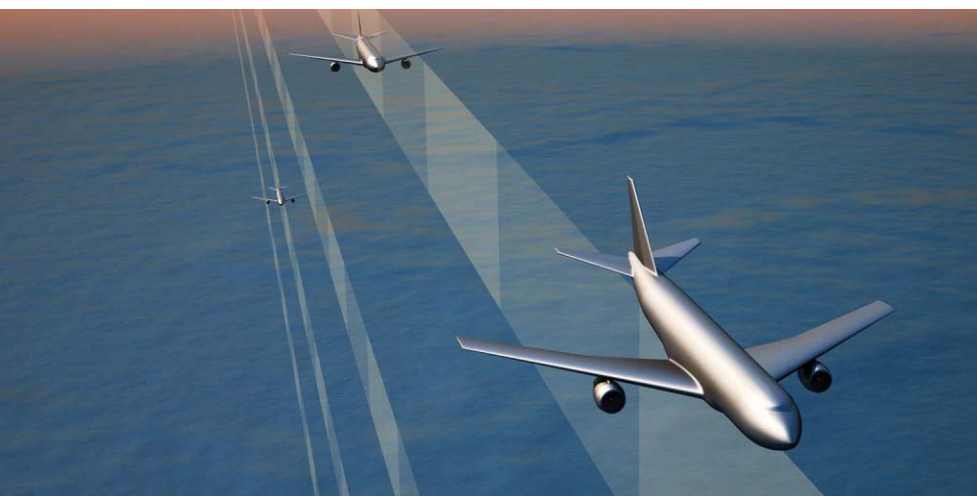
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SPECIAL REPORT



SafeRoute technology from ACSS enables aircraft to manage merging and spacing more efficiently when approaching runways.

One of the things yet to be determined is how to represent aircraft of different sizes and performance profiles on the cockpit display, Cundiff says. Each pilot also might have different preferences for how much information he wants displayed on the screen, Evanschwartz says. Some operators may want to use EFBs for surface area moving map applications to keep the pilot's eyes focused on the forward field of view, he adds.

Each company is testing its receivers, transponders, data processing software, and avionics displays with airlines and airframers to see what will work and what the pilots themselves feel will be most efficient.

ACSS and SafeRoute

The first commercial certification of ADS-B In technology involved cargo carrier United Parcel Service (UPS) and SafeRoute software tools from ACSS, Stone says. They integrated SafeRoute on six Boeing 757s and five 767s—using SafeRoute software on EFBs from Astronautics in Milwaukee. “We plan

to have the entire fleet [of 211 aircraft] equipped,” says Mike Mangeot, a UPS spokesman. UPS has already tested merging and spacing applications as surface area moving maps (SAMM). UPS saved about 250,000 gallons of fuel a year by using ADS-B In, reduced engine emissions by 30 percent, and cut noise

by 34 percent, Stone says.

SafeRoute is ACSS ADS-B In software that manages merging and spacing, Stone says, which helps aircraft maintain safe separation as they line up for arrival. Improving separation cuts fuel costs and improves arrival times, he adds.

ACSS upgrades to ADS-B In involves “a software update in the TCAS box,” Stone explains. “Then it becomes a surveillance processor and receives ADS-B data.” Sensor data then appears on the cockpit display of traffic information (CDTI), Stone continues. This can be done on EFBs or on the primary cockpit displays, but EFBs are more cost-effective, he says.

The CDTI involves the moving map, while the actual processing is performed back in the TCAS processor, he adds. It is not expensive to upgrade an aircraft, Stone says. The upgrade typically involves wiring to the aircraft GPS and cockpit display.



Honeywell's ADS-B avionics enable real-time aircraft position to be broadcast back and forth between aircraft in the air and the ground control stations.

SPECIAL REPORT

Product offerings

The TSS-4100 transponder from Rockwell Collins enables ADS-B In by turning the TCAS into an ADS-B In traffic computer, Evanschwartz says. It is part of the company's Pro Line Fusion integrated avionics system, he adds. The TSS-4100 transponder receives interrogations from ground and airborne secondary surveillance radars and replies by transponder to interrogation from air traffic controllers or TCAS avionics. The main upgrades for aircraft will be with display software and adding a new wire to connect to the GPS receiver, he says.

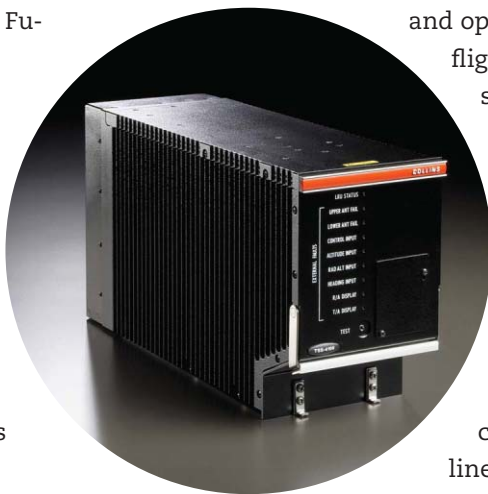
The TSS-4100 is packaged in the same box as the TCAS, he says. The traffic computer does not replace TCAS, as it will still be a backup, Evanschwartz says. Future ADS-B In software applications may enable the pilot to check the nomenclature, position, and flight path of nearby aircraft, Evanschwartz says.

Honeywell's SmartTraffic system enables the newly developed Airbus Airborne Traffic Situational Awareness (ATSAW) system by using ADS-B In technology, Cundiff says. A fuel savings of \$100,000 per aircraft is estimated to result from using ATSAW on transoceanic flights, Cundiff notes.

Honeywell's solution uses ADS-B In Hybrid Surveillance technology to minimize frequency congestion in addition to ADS-B In SmartTraffic technology to improve safety, reduce fuel consumption, and optimize long-haul flights. Honeywell's system is the only ATSAW offering which does not require new hardware installation, saving airlines more than \$25,000 per aircraft. Turkish Airlines selected ATSAW and Honeywell's SmartTraffic technology on 10 new A330s delivered in 2010 through 2012.

Honeywell also demonstrated transoceanic in-trail procedures with the FAA in 12 United Airlines 747-400s, Cundiff says. These aircraft were equipped with a TPA100B derivative, an electronic flight bag (EFB), and TRA67B transponder.

Most organizations that are running ADS-B In demonstrations are doing them more for technology development rather than a sales pitch, Cundiff continues. For example, during the United demonstration, an EFB was used to display ADS-B In information as it was more cost effective for the demonstration, but operators may choose to move it to the forward display based on their specific requirements—even though it will be more expensive, he continues. ←



The TSS-4100 transponder from Rockwell Collins enables ADS-B In by turning the Traffic Collision Avoidance System (TCAS) into a traffic computer as both are housed in the same box.

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Embedded and external data storage innovations ensure information security in network-centric, mil-aero environments.

BY **Courtney E. Howard**

The data storage needs of military and aerospace end users, be they personnel or organizations, are unique “because lives may depend on the security of the information,” says Joey Sevin, business development manager at Curtiss-Wright Controls Embedded Computing (CWCEC) in Ashburn, Va.

Mil-aero applications are most set apart by the stringent security and environmental specifications that products must meet, says Paul Ambuehl, storage technical lead, and Daniel March, systems technical lead, at Extreme Engineering Solutions (X-ES) in Middleton, Wis. “Most military and aerospace customers require storage products to operate within the demanding environments of MIL-STD-810F, including harsh temperatures from -40 to 85 degrees Celsius, as well as severe shock and vibration conditions,” Ambuehl explains. For these types of applications, systems designers prefer solid-state disks (SSDs) because SSDs are built to withstand military-grade temperatures, shock, and vibration that can be difficult to meet with conventional rotating media.

Proponents of solid-state technologies continue to grow in number, as SSDs increase in capacity and decrease in price, yet demand for rotating media still exists, given its low cost and widespread use in legacy systems. Mil-aero professionals continue the rotational vs. solid-state debate,

with some technology firms choosing allegiances to one and others providing access to both types of hard drives. X-ES is considered “bullish” on SSD technology for mil-aero applications, for example, while companies such as Crystal Group Inc. in Hiawatha, Iowa, and Phoenix International in Orange, Calif., offer mil-aero customers a choice of rotational or SSD storage.

COTS and custom

“There is actually quite a list of requirements that are unique to military and aerospace

General Micro Systems’ Golden-Eye II S802R-4 is a rugged, lightweight, Core 2 Duo Penryn system with four removable, solid-state drives.

users of

storage,” admits Paul Davis, director of product management at Curtiss-Wright Controls Electronic Systems in Santa Clarita, Calif. Mil-aero storage requirements include: performance, capacity, environmental qualifications (such as



temperature, shock, and vibration), information assurance (including encryption, key management, and counterfeit parts), unwanted electromagnetic emissions (EMI/TEMPEST), cost, and size, weight, and power (SWaP), explain Davis and Tom Bohman, senior product manager at Curtiss-Wright Controls Electronic Systems.

"While commercial storage systems often have many of these same requirements," Davis adds, "it is not to the degree or in the combinations required in most military systems. The unique requirements



can be attributed to the mobility and locations in which these military systems must operate without fail."

"All these needs are not synergistic, and many tradeoffs must be made to get the right combination of features at the lowest possible cost," Bohman describes. "For example, the larger the capacity, the more difficult it will be to minimize SWaP and cost. Because of the many variables,

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it is often best to seek help from a company, such as Curtiss-Wright, who can rapidly repackage its off-the-shelf (OTS) technology into an optimized storage solution."

The commercial market continues to advance data storage technologies, delivering higher capacities in

a smaller form factor requiring less power; and, mil-aero applications benefit from the use of these commercial off-the-shelf (COTS) systems. Mil-aero professionals increasingly are opting for modified COTS (MOTS), however, given the unique requirements of mil-aero applications.



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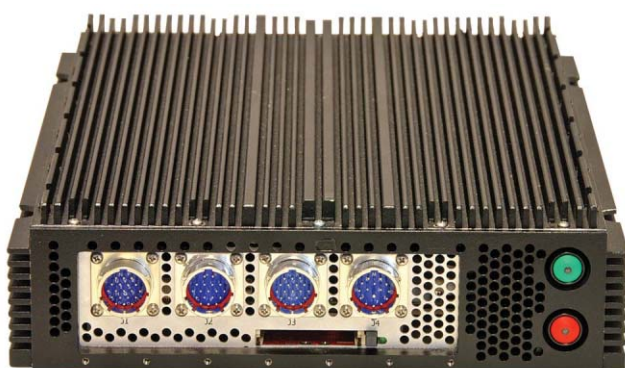


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SWaP prevails

"SWaP is the big driving factor for rugged, deployed storage," Bohman explains. After all, power and space, within soldiers' rucksacks and military vehicle platforms, are at a premium on the battlefield.

Size, weight, and power are still king in mil-aero environments, admits Sevin, who has added cooling, cost, and protection to the requirement matrix. "The digital battlefield will continue to follow the commercial industry technology roadmaps," he says. "The fact that we can now put 256 gigabytes of data in a 3U VPX module is very impressive."

"Mil-aero system designers typically request the maximum capacity that can be hosted on a single 3U card, with one terabyte being the common target point," Ambuehl says. "Today, we can support this requirement with a 512-gigabyte 3U VPX SSD hosting a 512-gigabyte XMC SSD."

X-ES engineers also devised an SSD XMC module and an SSD removable module in a proprietary form factor that fits onto a 3U VPX carrier and into a half-ATR chassis for mil-aero applications, March explains. The company's staff is also working on delivering a higher-capacity SSD XMC module and 3U VPX SSD with

512-gigabyte capacity to meet industry needs for greater storage capacities in more compact form factors.

Open systems

"Everyone is demanding open architectures, which

dictate that data storage devices have a standard interface," Sevin explains. "So now, the challenge is to be open-architecture and secure. There have been and will continue to be investments in securing data in open architectures. Cloud computing and other virtual computing services could become part of the military and aerospace user tools, but the data must be safe."

Curtiss-Wright Controls Electronic Systems has demonstrated "a high-TRL (Technology Readiness Level), cost-effective, modular approach to netcentric (network-centric) architecture modernization based exclusively on open-system building blocks," Davis reveals. "Derived largely from research performed for the U.S. Army's PM-HBCT (Project Management Office-Heavy Brigade Combat Team), the demonstration features data and video distribution, along with NAS (network-attached storage) recording and playback over a Gigabit Ethernet data bus backbone."

"It shows seamless bridging of legacy databus devices (e.g., CAN or 1553) to the Ethernet backbone, enabling a phased modernization approach," Bohman adds.

The need for open architectures

Crystal Group's TCM2 rugged computer with a bolt-on expansion base can accommodate up to ten 2.5-inch rotational or solid-state hard drives.

includes a call for common interface and connectivity options. "We most often see interface requirements for PCI Express and Serial Advanced Technology Attachment (SATA)," Ambuehl notes. A PCI Express interface is typically preferred over SATA, but X-ES's SSD products support both PCI Express and SATA, configurable via a jumper, he says.

Raw data streams

Today's network-centric battlefield is rife with various electro-optics, video, and sensor-based digital data acquisition systems working in intelligence, surveillance, and reconnaissance (ISR) capacities, with each gathering multiple terabytes of information daily. The need to store this wealth of data, such that it is secure and yet readily available, is driving the demand for file servers in the field.

Mil-aero professionals use specialized, high-speed, digital data recorders, such as those from Conduant Corp. in Longmont, Colo., to receive and store raw digital data streams that come directly from sensors, video, radar, and data acquisition equipment. These mil-aero users are most concerned with performance and fail-safe operation, reveals Ken Owens, chief executive officer of Conduant Corp. The company's systems are engineered with these requirements in mind, and to record data flows at rates up to 800 megabytes per second.

"Our clients demand that we

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maintain this very high performance level for long periods of time," Owen explains. "In addition, data loss is not an option with these highly sensitive applications. As certain operations move to the field, we are seeing more requests for ruggedized hardware, and because traditional disk drives are sensitive to shock and vibration, we are utilizing solid-state storage devices to build more reliable field units."

Conduant systems are gaining more airborne deployments, for which requirements include rugged enclosures, high-altitude operation, and higher tolerance to vibration and shock. "Traditional hard disk drives do not operate well above 10,000 feet given that disk heads ride on a cushion of air," Owens says. "Solid-state drives are desirable in these environments. Costs continue to drop and capacities are on the increase."

Conduant's systems are engineered to provide ultra-fast performance and long-duration recording, offering high-speed recording and playback of very large data stores at up to 800 megabytes per second. "We support 16 drive configurations up to 32 terabytes in capacity," Owens adds. "We supported the PCI Express interface both at the backplane and through industry-standard cabling."

"More and more data is being produced. More high-speed video recording and instant playback is

being deployed," Owen says. "We are continually exposed to requirements that push the recording rates. We see requests for recording rates that exceed 2 gigabytes per second. There is no question that solid-state devices will become much more common as their prices continue to drop."

Ben Sharfi, president and chief executive officer of General Micro Systems in Rancho Cucamonga, Calif., sees much the same trend. "The ability to store uncompressed live video feeds in real time from multiple channels requires extremely fast write speeds and is

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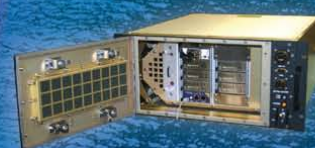


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pushing manufacturers into creating drives with up to 5-gigabyte-per-second transfer speeds.

"Partitioning drives into secure and unsecure partitions—setting encryption for only part of the drive while the remaining partition(s) can be accessed freely—also requires faster write speeds and higher-density media," Sharfi says. (Secure partitioning solutions are available from such industry firms as Green Hills Software in Santa Barbara, Calif.; LinuxWorks in San Jose; Mentor Graphics in Wilsonville, Ore.; QNX Software Systems in Ontario, Canada; SYSGO in Chicago, Ill.; and Wind River in Alameda, Calif.)

Secure network storage

A rapidly growing area for future data storage systems is secure network-attached storage (NAS), X-ES's March and Bohman explain. "NAS is gaining favor in avionics and vetronics system architectures over the dedicated recorder with direct-attached storage (DAS)," March describes. "Because most military system designs now include Gigabit Ethernet backbones, high-speed NAS devices are an ideal place to centralize and encrypt all the data, including the binaries that are booted at startup."

"The secure NAS device provides any intelligent subsystem read/write access to the storage via standard network protocols (NFS, CIFS, FTP, TFTP, HTTP, PXE), regardless of that subsystem's processor type or operating system," Bohman adds. "These network protocols are the universal language that allows network-centric systems to be quickly and

easily integrated to meet system requirements, then quickly expanded and upgraded to meet new and additional needs."

U.S. Air Force officials sought to modernize two data-based nodes in its network-centric architecture, the Distributed Common Ground System (DCGS). They elicited the help of NCI Inc.—a provider of information technology (IT), engineering, logistics, professional services, and solutions to U.S. Federal Government agencies located in Reston, Va.—to assist in the task.

NCI won a \$12.5 million, 12-month task order under the Air Force's NETCENTS (Network-Centric Solutions) program to provide engineering and integration services for two data centers in support of the DCGS. "This upgrade is very important in modernizing the DCGS architecture and to the DCGS mission," says Terry W. Glasgow, president of NCI.

Engineers at NCI and at team member ITT Corp. will procure, test, integrate, and deliver two Data Storage and Dissemination Centers (DSD) at Langley Air Force Base (AFB), Va., and Beale AFB, Calif. As a result of work on this task order, the netcentric DCGS enterprise will gain modern data storage, dissemination, processing, and retrieval capabilities.

Data protection

Computing continues to move closer and closer to the edge of the battlefield and, in many cases, even to the warfighter's pocket, Sevin notes; at the same time, mission-critical data



The Golden-Eye II S802R-S sealed, rugged, Core 2 Duo Penryn system from General Micro Systems sports removable hard drives.

that the warfighter requires—whether for survival, mission success, or both—must be shared. These factors compound the need for secure data storage on the battlefield.

"Real-time, actionable information requires communicating data directly to the warfighter, and it must be secure because troop movements and lives could be impacted," Sevin explains. Secure storage is, in this way, critical to achieving the goal of the network-centric battlefield: to deliver the right information to the right person at the right time.

Data, at rest and in motion, must be protected, Sevin continues. "Encryption is the method of protection that everyone is using, with several types of key management and encryption algorithms implemented in software, firmware, and hardware."

"There has been a huge increase in the amount and sensitivity of the data being stored on weapon platforms," Davis describes. "The data being stored now includes mission data, maintenance data, and complete digitized models of the Earth." As the volume and value of the stored data increase, so do concerns

TECHNOLOGY FOCUS

over damage that might be caused if that data is compromised, he says.

"Elaborate methods are being developed to secure data with encryption and, as important, are the key management concept-of-operations (CONOPS)," Bohman describes. "In many ways, the key management strategies are more difficult. It has to be easy and fast enough so as not to hinder the mission and, yet, it must be foolproof in denying access to the enemy should the system fall into enemy hands. A compromise must be found between ease of use in the field and protection of the data."

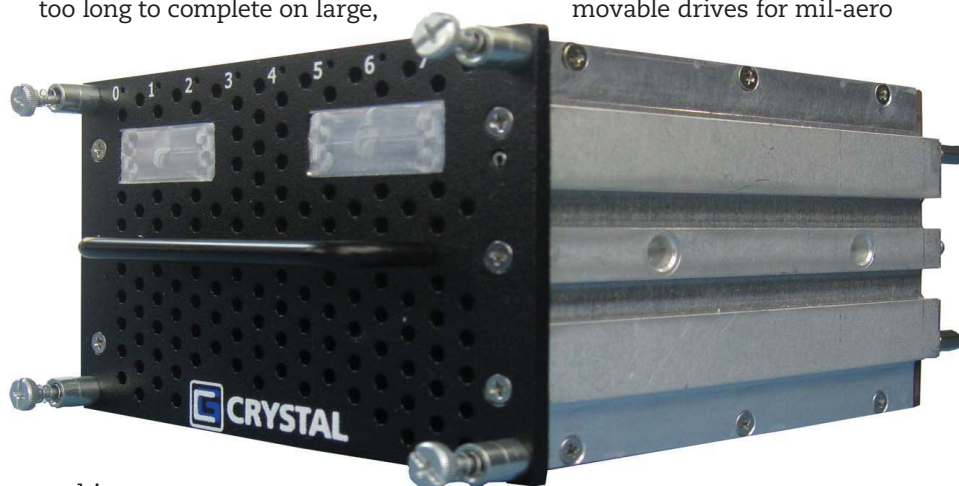
Encryption and erasure

"In terms of security requirements," Ambuehl says, "many applications require not only the data to be encrypted, but also the storage subsystem to support secure erase options. These secure erases involve a complete clearing and sanitization process that can meet specifications, such as DOD NISPOM (U.S. Department of Defense National Industrial Security Program Operating Manual) 5220.22-M. The secure erase options commonly requested include push-button erase, anti-tamper support, and battery backup, which allow erases to be initiated and completed despite power loss."

Security specialists have been seeking quicker and more automatic methods of erasing sensitive data from data storage systems, especially since the P-3 Orion was forced down in Chinese territory in 2001, according to Davis and Bohman. They refer to the now infamous U.S.-China aircraft collision incident in which a U.S. Navy EP-3 reconnaissance aircraft (as well as its on-board intelligence, electronics and

sensor systems, and crew) were retained for a period and inspected by the People's Republic of China.

"For many years, to zeroize all memory was the only way to sanitize and protect the data," Davis recalls. "Every Government and Department of Defense branch has its own elaborate memory erasure algorithms. When performed by the software, these processes can take too long to complete on large,



multi-gigabyte or -terabyte storage. Some solid-state disk vendors have implemented erasure algorithms in hardware to speed the process."

"Increasingly, the favored alternative is to encrypt the data before storing it with a very strong algorithm (AES-256, for example) and then provide for rapid and reliable erasure of the encryption key," Bohman says. "Thus, the data is protected from reading until the key is re-installed by a certificate authority."

Curtiss-Wright engineers adopted this method with the company's Compact Network Storage system and removable Flash Storage Module (FSM). A pushbutton, a discrete signal, or an authorized user can delete the key within milliseconds from a special non-imprint static random

access memory (SRAM) location, rendering the data unreadable.

Removable drives

Another valued method of ensuring secure data storage involves the use of systems having removable hard drives. Technology firms such as General Micro Systems Inc. and Crystal Group engineer electronics systems with multiple, removable drives for mil-aero

High-capacity, solid-state, Rugged Drivepacks from Crystal Group enable the transfer of data in 1 to 2 minutes by physically swapping out the drive packs.

applications.

General Micro Systems engineers developed the company's Depot SX401R-4 with mil-aero needs and requirements in mind. The system is compact, rugged, and low-power, and it supports up to four removable, sealed solid-state drives. Its ultra-small footprint measures 6 x 3.5 x 3 inches, and it weighs 2.5 pounds. The Depot can be configured with up to 1 terabyte of storage capacity. It can serve as network-attached storage, and the removed SSDs can be accessed via SATA or USB interfaces.

"It fits in the palm of your hand," explains Ryan Steely, vice president of marketing at General Micro

TECHNOLOGY FOCUS

Systems. “The 1.8-inch drives pull out and can be accessed via a USB port on the back. In addition to offering data storage, it’s a complete computer system.”

The company’s GoldenEye II family of compact, rugged systems—including the S802R-4, S802R-S, and S802R-LP—are designed to provide up to 2 terabytes of storage capacity across multiple, removable, solid-state drives.

Crystal Group—a designer and manufacturer of rugged, COTS, custom-designed computers, displays, networking devices, embedded systems, and storage devices—has unveiled its TCM2 Tactical Computing

Module with options for removable storage media. The embedded module is tailored for “environments where performance, ruggedness, and reliability are imperative, such as military shipboard, airborne, and land-based applications,” says a company representative.

The TCM2 high-performance embedded computer is designed to operate in extreme environments and to run on conventional, 12-volt vehicle power or 24/28 volts of DC power to meet the requirements of many mil-aero applications. It is available with two 2.5-inch rotational or solid-state hard drives and can accommodate as many as eight more drives with the addition of a bolt-on expansion base, enabling a single TCM2 to deliver up to 4.8 terabytes of rotational hard drive storage or 1.28 terabytes of SSD storage.

Solid-state future?

Mil-aero industry innovators anticipate that solid-state technology will continue to replace and outpace adoption of rotational hard drives in mil-aero environments.

“Solid-state media lacks moving parts, which makes it inherently better than rotating media for the environments that mil-aero vehicles must withstand,” Ambuehl says. “In the past, mil-aero systems included rotating media as a concession because there was no other choice for high-density storage. Now, with the densities that solid-state media can provide, SSDs are able to provide the storage capacity required by many applications.

“Going forward, I expect solid-state media to be selected for any



General Micro Systems’ Depot SX401R-4 is a sealed, rugged, low-power system with quad removable solid-state drives.

new designs,” Ambuehl adds. “The cost/density disadvantage that solid-state media has when compared to rotating media seemingly disappears when weighed against the inherent ruggedness in a high shock and vibration environment.

“It will not be long until there are SSDs with encrypted densities in the multi-terabyte range, with read and write performance two to three times that of current SSDs,” Ambuehl predicts. “Before the end of 2011, we should be able to provide a 1TB SSD in a single 3U VPX form factor.”

Beyond SSD, secure data storage systems of the future are likely to provide more of precisely what mil-aero users need. Specifically, they will be smaller, faster, and offer “more disbursement of actionable information to the warfighter safely to the edge,” Sevin says.

In the not too distant future, Ambuehl anticipates storage modules will “become intelligent self-contained entities, with their own security policies and the ability to self-declassify (essentially erase with overwrite). For example, for a CPU to access the data stored in the storage module it will have to first authenticate with the storage module.” ◀

COMPANY INFO

3D Plus

www.3d-plus.com

Conduant Corp.

www.conduant.com

Crystal Group Inc.

www.crystalrugged.com

Curtiss-Wright Controls Electronic Systems

www.cwcelectronicsystems.com

Curtiss-Wright Controls Embedded Computing

www.cwceembedded.com

Extreme Engineering Solutions (X-ES) Inc.

www.xes-inc.com

General Micro Systems

www.gms4sbc.com

Kaman Aerospace

www.kamanaero.com/memorysystems.html

Phoenix International

www.phenxint.com

Smart Modular Technologies

www.smartm.com

Trident Space & Defense LLC

www.tridentsd.com

Western Digital

www.wd.com

OPINION

View from the design bench: the Joes dig FPGA reconfiguration

BY **Dave Rupe**

We all know him, the unshaven guy with the thick glasses and wrinkled utensil-filled shirt. He lives and breathes every DC gadget, follows Slashdot like a religion, and loves to reinvent the wheel 100 different ways, just for the fun of it. If allowed, he will make it his life's goal to eek another picosecond out of his FPGA state machine just to see what happens if he runs the design at twice the required clock rate. He might even write a new UART because the one he wrote last week worked well enough, but it wasn't as elegant as it could be.

Brief eye contact with Joe Tech reveals disappointment when you congratulate him on a job well done, but break the news to him that the project he was working on has to end. Without being too perceptive, you catch him shift to excitement as he envisions the architecture of the next-generation FPGA product when you tell him the requirements doc will be on his desk tomorrow morning. His UART won't connect up to the new infrastructure, so he'll get to rewrite it after all!

If only you could convince Joe Tech that he won't lose his job, or

his fun, if he'd agree to use an existing COTS framework that would allow him to simply reconfigure how his components are connected when building the next FPGA project. Then you could get him to be more efficient and finish projects and features, rather than just playing with an ever-changing laundry list of components, sub-components, and variants.

It's been a tough sell, but fortunately Joe Tech might have accidentally glimpsed the "big picture" that afternoon. A buddy of his on IRC has a sister whose boyfriend, while in camo sitting shotgun in a Hummer, had to tune his radio to a higher bandwidth channel so he could get a pinpoint visual on the source of some mortar shell blasts.

Apparently, the heat had messed with something Joe Tech calls "signal integrity" and the SerDes data link was unstable under the extreme conditions. Fortunately, despite the pressure, G.I. Joe remembered his training and knew that he could input some new settings to reconfigure the radio for the current environment (a.k.a. Dynamic Reconfiguration).

Just in time, the hostile's position lit up on his display. Within seconds, G.I. Joe had eliminated the threat and earned himself a medal for the trip home. After word of the successful mission and the enabling radio widget traveled the tech blogs back to the Build Cool Stuff Corp. engineering department, Joe Tech was now much more open to your chiding that leveraging an existing framework really isn't a sign of weakness, as he decides to give it a try tomorrow on the new project. In fact, Joe is almost excited that it might enable him to build tomorrow's bigger, better system quicker and still have time to add in features even he couldn't fathom if he were writing his seventh, more-elegant variant of the UART.

A few months later, Joe Tech is so psyched about his productivity using the COTS framework you pushed him to use that he sends you an e-mail (reproduced on page 28) containing all the nitty-gritty details of tomorrow's project—as if you had a chance of understanding half of the nit or the grit. In fact, being Joe Boss, all you care about is the answer to one question: What kind of ROI (return on investment) does this framework path provide?

DAVE RUPE is the field-programmable gate array (FPGA) product manager at BittWare Inc., a specialist in embedded signal processing, located in Concord, N.H.

Joe Boss,

This framework stuff isn't so bad. In fact, I got the project up and running so quickly that I was able to add tomorrow's feature today, and it is not dev/null!

At this point, you pretty much have your answer to the ROI question, but because Joe Tech seemed to have put a lot of effort into explaining the details of this stuff, a twinge of guilt prevents you from filing this one in the recycle bin without at least skimming the rest of its contents.

The e-mail continues:

Check this out... It is Wednesday and I have been able to leverage each form of reconfiguration, THIS WEEK!

Monday (Project Reconfiguration):

It turns out the switch we we're using had way too many ports. As a result, the bandwidth allocated to each port was restricting the DDR3 throughput and blowing our latency budget. Quick fix: The switch component like all the others in this COTS package use a common interface. The framework's common interface makes it so that all components with the same interface type, memory mapped for addressable transactions, like control and status, and streaming for high-speed, point-to-point transfers, are all interchangeable.

In the past, I built adapters and interface translators each time I connected different components together. It's not my fault that Joan Tech does hers differently. Anyway, I realized that ports 6–8 don't need to be on the same switch as 0–5 because its "goesintos" and "goesouttos" don't ever goesintos and goesouttos the others.

Well, the common interfaces allowed me to pull out the extra ports and direct connect the SerDes physical interface to the DMA controller. Of course, at this point in the past, I would have to write a new switch, this time with fewer ports, because I would never waste resources with extra logic for unused switch ports. But, the switch component has an arrayed common interface that is as large or small as the number of ports connected to it.

How cool is that? On top of that, the DMA controller was expecting 64-bit streaming data input, while the SerDes receiver was pumping out 128 bits. I just changed the data width parameter on

the SerDes receiver to 64 and bada bing, bada boom, they play nice!

Tuesday (Static Reconfiguration):

We got the new Stratix IV COTS hardware in. Since the COTS board used in phase one of the project had a Stratix II device, I was looking forward to writing my own SerDes transceiver to help port the FPGA design to the new board. It was awful; there was a blaringly obvious parameter named "BOARD_INFO" that I could not in good conscience ignore.

All I had to do was change the "FAMILY" field from "SIIGX" to "SIV" and call the supplied synthesis scripts indicating the new board, and my work was done. Again, a glimmer of hope. It turned out that the SFP interface wasn't limited to 2.5 Gb/s like we thought. It can actually support SFP+, and run at 5 Gb/s. The COTS SerDes component has a SERDES_SPEED parameter; by simply changing the value from 2.5 Gb/s to 5 Gb/s, I was able to get that pretty eye back up on the scope before lunch. It would have been really swell to write my own SerDes component but, lucky for me, I was able to stare into those eyes the rest of the day.

Today (Dynamic Reconfiguration):

Turns out that when she got hot in the environmental chamber today, the lady needed a bit of Visine to open up her eyes. It would have taken me a week to implement and test code to adjust the analog controls like VOD, preemphasis, and equalization to clear up the bit error rate issues. I simply popped open the COTS framework's SerDes component manual and spotted a set of reconfiguration registers already implemented.

I was upset I didn't get to write any of the SerDes reconfiguration control, but calculating the SerDes reconfiguration settings using my trusty TI-86 always brightens my day. I updated the host software by adding the settings to my hash and, once again, my calculations were correct the first time and the BER measured within spec.

Tomorrow:

Since I am ahead of schedule, can I spend the next week experimenting with the different Static and Dynamic Reconfiguration settings?

Later,
Joe Tech

No way you are going to let Joe Tech burn company dollars when you could get a jump start on the next project! What about field maintenance? What if G.I. Joe requires a costly FPGA redesign updated with a new signal processing channel

supporting more dynamic range or a slower but more robust SerDes link?

At this point, you probably need to remind yourself that the reason you encouraged him to go with that COTS FPGA framework methodology was because it enables reuse and

portability leading to more efficient development and less costly maintenance... so you throw Joe Tech a bone, and let him have a few days to play with project features and enhancements, rather than that stupid laundry list and UART. ←

PRODUCT intelligence

Smart power devices help push the bounds of device size and efficiency

BY John Keller

The growing use in aerospace and defense electronic systems of smart power management is enhancing the efforts of systems designers not only to enhance power system health monitoring, but also to push the bounds of power capacity and device efficiency, and shrink the size and weight of devices. Power device manufacturers today can take advantage of powerful and commercially available digital microprocessors to handle automatic power monitoring, control, and communications far more easily and efficiently than they could years ago, when automated power control required the use of complex and expensive application-specific integrated circuits (ASICs), explains Martin Schlecht, president and chief executive officer of SynQor Inc. in Boxborough, Mass.

"The digital power processor gave us the reality of an ASIC, but in less space and far fewer components, and we also no longer pay the price of customization," Schlecht says. With that readily available digital control for power electronics, power supply designers can enhance the capabilities of the power sections of devices without adding size and weight.

"By devoting less room to the control circuit, more room can be devoted to the power circuit," Schlecht continues. "This helps us process more power, or process the same

amount of power more efficiently. What digital control gives us is the ability to move toward smaller devices at lower power."

Increasing the efficiency in power management, as well as shrinking the sizes of power supplies and

other power-management devices, are among the biggest pushes today in power management design, says Kai Johnstad, senior product marketing manager for defense, aerospace, and transportation products at Vicor Corp. in Andover, Mass. "The big

COMPANY INFO

Absopulse Electronics
www.absopulse.com

Aeroflex Inc.
www.aeroflex.com

AJ's Power Source Inc.
www.ajpower.com

Analytic Systems
<http://analyticssystems.com>

Astrodyne Inc.
www.astrodyne.com

Behlman Electronics Inc.
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Comdel Inc.
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CUI Inc.
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DRS Pivotal Power
www.drspowersolutions.com

Electromech Inc.
<http://electromechinc.com>

Energy Technologies
www.ruggedsystems.com

Falcon Electric Inc.
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Gaia Converter Inc.
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International Rectifier
www.irf.com

Interpoint, a Crane Co.
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Pico Electronics Inc.
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Schaefer Inc.
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TDK-Lambda
<http://us.tdk-lambda.com/hp/>

Teledyne Microelectronics
www.teledynemicro.com

Tracewell Systems
www.tracewellsystems.com

Transistor Devices Inc. (TDI Power)
<http://tdipower.com/>

UltraVolt Inc.
www.ultravolt.com

Vicor Corp.
www.vicr.com

Vishay Intertechnology
www.vishay.com

VPT Inc.
www.vpt-inc.com

XP Power
www.xppower.com

PRODUCT intelligence

push in efficiency is in trying to get smaller power supplies, but with the power that users need. Smart power enables designers to maximize efficiency, and gives them greater ability to control the power system.”

While digital interfaces in power devices have been available in one

form or another for many years, today’s power electronics often have the ability to monitor currents, voltages, temperatures, and outputs, and then report back to a system computer, points out Mike Innab, president of North American operations at Martek Power Abbott in Torrance, Calif.

“Digital control can let the computer know how the power supply is, make sure everything is okay, and help determine if a failure is about to happen,” Innab says. “If a thermal shutdown is about to happen, we can give a warning at five to ten degrees before shutdown occurs. With digital control, every output is monitored. In a critical application, the system monitor can see where it might be getting into trouble, before it actually gets into trouble; with these new systems, they often can see it coming.”

Digital control and communications enables very fine changes in current to keep power within the bounds of sensitive equipment. “Smart power can sense voltage and raise or lower it to correct for errors,” says Schlecht. “That has to be quite fast. You have to do it in microseconds; new processors are developed with circuitry to do these kinds of calculations very quickly.”

One concern involves the military’s need for sophisticated smart power technology. “As far as the military goes, there are not that many advantages I see with digital control, except where the system is able to communicate with the power supply,” Innab says. “One area I do see for smart power is battery chargers, where the algorithms to charge the batteries are quite complex. You can get more life out of batteries with smart power.”

In the days of tight military budgets, defense systems designers are concerned with system upgrades and technology insertion, in which smart power often is not a high priority. “There is a lot of retrofitting older vehicles and older airframes, and smart power is not as needed in those applications,” says Vicor’s Johnstad. ◀



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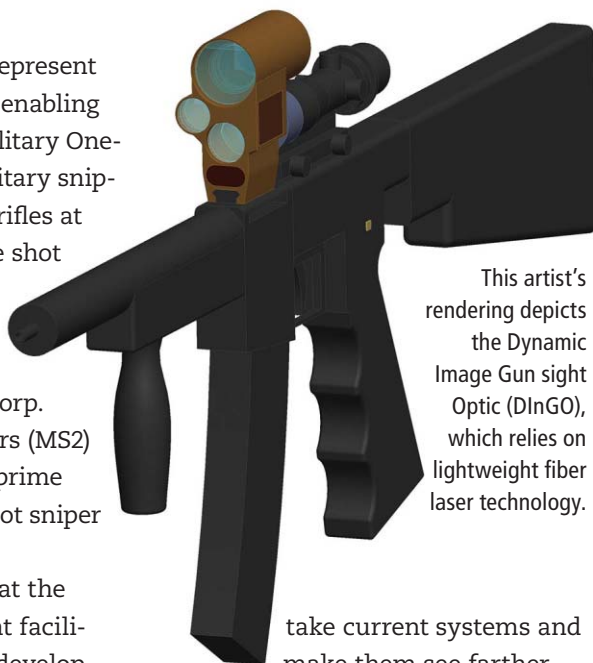
Lockheed Martin relies on Aculight fiber laser technology for One-Shot program's sniper targeting system

BY John Keller

AKRON, Ohio—Fiber lasers represent perhaps the most crucial enabling technology in the U.S. military One-Shot program to help military snipers hit targets with their rifles at long ranges with only one shot at night, in crosswinds, and in other difficult conditions, say experts at the Lockheed Martin Corp. Mission Systems & Sensors (MS2) segment in Akron, Ohio, prime contractor for the One-Shot sniper targeting initiative.

Military laser experts at the Lockheed Martin Aculight facility in Bothell, Wash., are developing a lightweight fiber laser technology for the One-Shot program, as well as for other precision-engagement technologies under development at Lockheed Martin. This laser not only illuminates the sniper's target at night using a wavelength invisible to the naked eye, but also measures wind speed and direction based on light returns from particles between the shooter and target to compensate for the effects of crosswinds.

"We have realized the importance of small, high-performance fiber lasers," explains John Wojnar, director of business development in the Lockheed Martin Ship and Aviation Systems unit within the company's MS2 division. "We want to



This artist's rendering depicts the Dynamic Image Gun sight Optic (DInGO), which relies on lightweight fiber laser technology.

take current systems and make them see farther.

Adding an active-illumination source, like a fiber laser, enables you to do that."

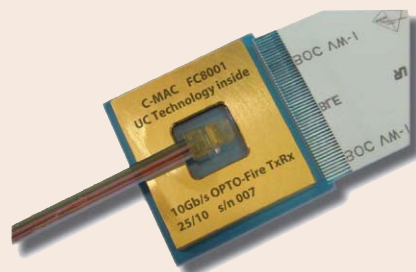
Lockheed Martin acquired fiber laser specialist Aculight Corp. in Bothell, Wash., in 2008, and relies on Aculight's expertise in weapons-quality fiber lasers as enabling technologies for a variety of precision-engagement systems in addition to the One-Shot program. Aculight now is a business unit of Lockheed Martin MS2 in Akron, Ohio.

The wavelength of the fiber laser that Lockheed Martin uses in the One-Shot program is a military secret, but Wojnar says company experts use wavelength agili-

CONTINUED ON PAGE 32 →

C-MAC/Ultra Communications partnership aims at optical databus interface for rugged avionics applications

C-MAC MicroTechnology in Old Amersham, England, is working together with Ultra Communications Inc. in Vista, Calif., to develop state-of-the-art, 10-gigabit-per-second optical transmit and receive avionics databus interface modules for military and space applications. C-MAC experts developed the STANAG 3910 optical transceiver for



the Eurofighter combat jet, and plan to capitalize on that optical avionics databus technology to design and manufacture next-generation optical databus products for defense, aerospace, and space applications in existing and future systems in harsh environments, company officials say. C-MAC's transceiver initially will provide four transmit and four receive optical channels, each running at 2.5 gigabits per second using the Ultra Communications optical core. The device will be packaged in a hermetic enclosure and qualified to international military and space standards and evolving JEDEC standards. Ultra Communications is a 2005 spin-out of Peregrine Semiconductor.

FOR MORE INFORMATION contact C-MAC online at www.cmac.com, or Ultra Communications at www.ultracomm-inc.com.

FIBER LASER CONTINUED FROM PAGE 31

ty technology—which rapidly hops between a set series of laser wavelengths—to hide the sniper targeting system's laser illuminator even from specialized laser-detecting equipment. The range of the fiber laser is greater than 2 kilometers (1.24 miles).

Miniature electro-optics

Other primary enabling technologies for the One-Shot program include miniaturized electronics and small commercial off-the-shelf (COTS) optical elements that Lockheed Martin is able to obtain from commercial cameras and other commercial optics.

Lockheed Martin MS2 won a \$6.9 million contract in late September from the U.S. Defense Advanced Research Projects Agency (DARPA) in Arlington, Va., for advanced development on the One-Shot program, which calls for the company to deliver 15 field-testable and hardened prototype One-Shot sniper targeting systems by October 2011 that provide the capability to profile down-range crosswind and range to target in near real time, at longer ranges, and improved probability of a first round hit.

The size and weight goal for the initial 15 prototypes is no heavier than 3.74 kilograms—slightly more than eight pounds—that will fit on standard .308 and .338 caliber military sniper rifles, Wojnar says. Lockheed Martin has options to produce an additional 100 units, potentially for use by warfighters in the field. First deployment of the One-Shot sniper targeting technology could be as early as late 2012.

Lockheed Martin experts are ap-

plying technology from the One-Shot program also to an experimental advanced rifle sight called the Dynamic Image Gun sight Optic (DInGO) to help every soldier be a marksman by enhancing the ability to hit targets at ranges from 10 to 2,000 feet, Wojnar says.

In addition, Lockheed Martin plans to apply One-Shot technology to a program called the Autonomous Rotorcraft Sniper System, which enables snipers to acquire and attack targets remotely, either from manned or unmanned helicopters or from fixed-site towers. This program has a rifle mounted to a stabilized turret on a tower or helicopter with a video feed back to its trained sniper operator, Wojnar says.

Compensating for crosswinds

The One-Shot system's integrated spotter scope (ISS) will be able to measure crosswinds, maximum effective range of the weapon, temperature, atmospheric pressure, humidity, cant and pointing angles, and GPS coordinates, as well as allow direct day and night observation of targets with continuous updates of the aim point offset corrections, with no alignment verification of the laser/crosswind optics to the spotting scope necessary.

The rifle scope also should communicate the aim point offset and expected crosswind variability to the rifle scope using a wired or wireless data link.

This work is Phase 2E of the DARPA One-Shot program, which was begun in 2007 by Lockheed Martin MS2. In Phase 2E, Lockheed Martin will develop a field-testable prototype observation, measurement,

and ballistic calculation system that enables snipers to hit targets with the first round, under crosswind conditions, up to the maximum effective range of the weapon.

DARPA solicitation

DARPA released a broad agency announcement (DARPA-BAA-10-67) for this work last May. Lockheed Martin experts will develop a system to provide day and night direct observation of the target, measure everything that influences a bullet in flight, and rapidly calculate and display the aim point offset and expected crosswind variability in the shooter's rifle scope.

The system will use technologies to operate over a range of visibilities, atmospheric turbulence, scintillation, and environmental conditions. Lockheed Martin will deliver 15 operational and field-hardened systems, with options for as many as 100 additional units.

In the first phase of the One-Shot program, Lockheed Martin developed a brassboard down-range system that measured average down-range crosswind, range to target, spotter scope position, target heading, air temperature, pressure, and humidity to calculate the ballistic solution for a 0.308 bullet at ranges as far as 3,600 feet.

Although the brassboard system improved the first-round hit probability, its size, weight, and power (SWaP) were inadequate, the engagement range too short for the newest sniper weapons, and it could not be used with standard rifle scopes. ➔

FOR MORE INFORMATION contact Lockheed Martin MS2 online at www.lockheedmartin.com/ms2.

PRODUCT applications

SENSORS

Ground-penetrating radar gaining acceptance worldwide to detect IEDs and other buried threats

Ground-penetrating radar (GPR) technology from 3d-Radar AS in Trondheim, Norway, has been sold to nations in Europe, North America, and South Asia for deployment and use in military threat detection systems, report officials of 3d-Radar, a business unit of Curtiss-Wright Controls Inc. in Charlotte, N.C.



3d-Radar has made sales to the U.S. Army for overseas operations.

The company's advanced GPR Detection System is deployed and is accomplishing its mission to locate buried threats, such as improvised explosive devices (IEDs), company officials say.

3d-Radar's GPR technology includes a radar control unit, GeoScope, which enables operators to view pre-processed GPR data within milliseconds of the initial capture, and displays data from all of the GPR system's channels.

FOR MORE INFORMATION contact 3d-Radar online at www.3d-radar.com.

ELECTRONIC WARFARE

Improving surface warship radar, communications, and electronic warfare is goal of InTop contract

U.S. Navy shipboard electronics experts needed a scalable suite of electronic warfare, information operations, and line-of-sight shipboard communications on naval surface warships. They found their solution from the Northrop Grumman Electronic Systems segment in Linthicum, Md., and Northrop Grumman partner ITT Corp.'s Radar, Reconnaissance, and Acoustic Systems

division in Van Nuys, Calif.

The Northrop Grumman/ITT team won an initial \$18 million contract worth a potential \$109 million from the Office of Naval Research (ONR) in Arlington, Va., for the Integrated Topside (InTop) program to consolidate the number of advanced RF antennas aboard surface warships to increase communications bandwidth, as well as resolve electromagnetic interference/electromagnetic compatibility issues caused by the large number of antennas on today's Navy ships.



Northrop Grumman is prime contractor, and ITT will provide key support. Both companies are specialists in sophisticated shipboard radar, communications, and electronic warfare systems.

The Integrated Topside (InTop) is an Innovative Naval Prototype (INP) program that will develop a scalable family of electronic warfare (EW), radar, and communications capabilities to support several classes of Navy warships and other Navy platforms. InTop will use a modular/open RF design to dominate the RF spectrum and create scalable systems.

InTop plans to reduce the number of topside apertures on Navy ships by using integrated, multi-function, multi-beam arrays. A growing number of antennas aboard today's surface combatants has led to problems with Electromagnetic interference (EMI), radar cross section (RCS), and the overall performance of shipboard electronic warfare and communications.

InTop builds on previous ONR work on multi-beam, multifunction apertures capable of simultaneously supporting EW, communications, and radar functions in two separate transmit and receive arrays.

"InTop is a game changer for the Navy," says Steve McCoy, vice president of the advanced concepts business unit at Northrop Grumman

PRODUCT applications

Electronic Systems. "It is intended to improve ship survivability by providing counter measures to anti-ship missiles more effectively, making this a critical asset to the warfighter."

Northrop Grumman and ITT will do the work at the company's engineering and manufacturing center in Linthicum, Md., and ITT's Radar, Reconnaissance, and Acoustic Systems division in Van Nuys, Calif.

FOR MORE INFORMATION visit www.es.northropgrumman.com or www.defense.itt.com.

TEST AND MEASUREMENT

Agilent Technologies wins \$35 million contract from U.S. Army for microwave signal generators

Agilent Technologies Inc. in Santa Clara, Calif., won a contract from the U.S. Army to deliver as many as 1,600 MXG microwave analog signal generators over seven years, as part of the Army's Test Equipment Modernization (TEMOD) program.

The TEMOD program was developed to replace obsolete general-purpose test equipment with state-of-the-art alternatives. Its mission is to improve the readiness of current and future Army systems, while reducing operating and support costs.

In 2008, the TEMOD program office began investigating options for replacing its inventory of old, obsolete microwave signal generators from several vendors with a single modern, supportable unit, reveals a representative. Following a 10-month technical evaluation, the Army selected Agilent's MXG microwave signal generator as the replacement.

Agilent will provide the Army with a special version of the N5183M MXG microwave analog signal generator tailored to its requirements.

FOR MORE INFORMATION visit **Agilent** online at www.agilent.com.

COMPUTERS

Navy taps Progeny Systems for client server applications aboard attack submarines

U.S. Navy officials needed military client server applications that provide access to non-propulsion electronic systems on Navy Virginia-class fast attack submarines and various commercial off-the-shelf (COTS) subsystems. They found their solution from Progeny Systems Corp. in Manassas, Va.



Progeny will develop and modify client server applications to access Virginia-class submarine electronic systems and COTS subsystems under terms of a \$9.5 million one-year contract. Progeny Systems also will provide the Navy with a "fly away" team and equipment to support timely client server service worldwide. Awarding the contract were officials of the Space and Naval Warfare Systems Command (SPAWAR) Systems Center Pacific in San Diego.

The contract, which is part of a Small Business Innovative Research (SBIR) Phase 3 agreement, has four one-year options that could increase the value to as much as \$49.9 million, Navy officials say. Progeny experts will do the work in Portsmouth, Va., and in Groton, Conn.

FOR MORE INFORMATION visit **Progeny Systems** online at www.progeny.net.

SENSORS

Lockheed Martin to upgrade signal processing for IUSS global undersea surveillance system

U.S. Navy anti-submarine warfare (ASW) experts has selected the Lockheed Martin Corp. Information Systems & Global Solutions-Defense segment to upgrade the Navy's common Integrated Undersea Sensor System (IUSS) Integrated Common Processor (ICP) system to enhance underwater surveillance and situational awareness. The IUSS helps Navy operators locate and track surface ships and submarines in wide areas of the world.

Lockheed Martin won a \$24 million contract from the Space and Naval Warfare Systems Command in San Diego to provide sonar signal processing technology updates and new concepts to IUSS signal processing, as well as to provide automatic submarine detection and tracking to reduce operator workload, simplify operator training, and keep system development costs down.



"The capabilities we are providing will help detect, track, and localize undersea threats faster and more accurately," says Jim Quinn, vice president of Lockheed Martin's Information Systems & Global Solutions-Defense. ←

FOR MORE INFORMATION visit www.lockheedmartin.com.



To submit new products for consideration, contact John Keller at jkeller@pennwell.com

new PRODUCTS

RUGGED COMPUTERS

Vehicle-mounted tablet for tactical situational awareness developed by Lockheed Martin

Lockheed Martin Corp. has developed a ruggedized tablet computer for use in tactical vehicles. The TacFleet 8 enables real-world tactical situational awareness exchanges for brigade-and-below forces on the move. Lockheed Martin's TacFleet 8 provides superior tactical communications capabilities while meeting ultra-ruggedized military standards for harsh environments in combat and civil operations. The tablet will be mounted into a lightweight and compact dock, and is compatible with current U.S. Army Force XXI Battle Command Brigade-and-Below (FBCB2) systems. It allows users to exchange messages with other terrestrial and airborne units, as well as utilize sophisticated mapping tools. The TacFleet 8 meets all Joint Battle Command-Platform and FBCB2 requirements. TacFleet 8 users can also wirelessly control and stream imagery from ground vehicles and fixed- and rotary-wing aircraft sensors. Lockheed Martin has demonstrated this capability in the company's Tactical Situational Awareness Demonstration Center using the Gyrocam 15 TS sensor system, which is currently fielded on more than 700 MRAP vehicles. The TacFleet 8 interfaces with both 9-inch class and 15-inch class Gyrocam systems, and can be readily adapted to operate other sensor systems. The TacFleet 8 builds on Lockheed Martin's experience

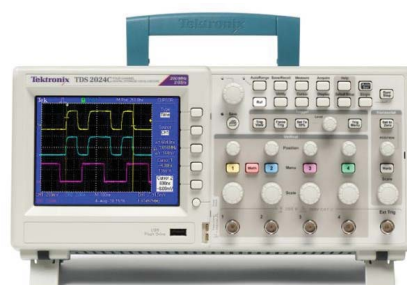
with ground soldier technologies, including the Common Controller Device and TacScope, and production programs like the Apache Modernized Target Acquisition Designation Sight/Pilot Night Vision Sensor system.

FOR MORE INFORMATION visit **Lockheed Martin** online at www.lockheedmartin.com.

TEST AND MEASUREMENT

Oscilloscopes for design and debug, manufacturing test, service, and repair introduced by Tektronix

Tektronix Inc. in Beaverton, Ore., is introducing the TDS2000C series oscilloscopes with models ranging from 50 MHz to 200 MHz band-



width, and with two or four channels. Test and measurement uses include design and debug, education, manufacturing test, quality control, service, and repair. Two models that were 60 MHz are 70 MHz bandwidth and two models that offered 1 gigasamples per second sampling rates are at 2 gigasamples per second. All models connect with USB ports and feature 16 automated measurements, limit test, and built-in help menus. The TDS2000C series has digital real-time sampling with at least 10X

oversampling on each channel. The sample rate does not reduce as additional channels are turned on, ensuring that each channel can capture signals up to the oscilloscope's full bandwidth. The user interface includes autoset menu, built-in help system, probe check wizard, and optimized instrument setup and operation, advanced triggering to capture events coupled with advanced math capabilities, and 16 automated measurements for fast analysis.

FOR MORE INFORMATION visit **Tektronix** online at www.tek.com.

DATA STORAGE

Rugged, removable SATA solid-state drive with encryption introduced by X-ES for military applications

Extreme Engineering Solutions Inc. (X-ES) in Middleton, Wis., is introducing the XPort6192 ruggedized, removable SATA solid-state drive for conduction- or air-cooled military applications that require secure, high-capacity, and high-performance removable rugged data storage. The rugged solid-state



memory device supports 256-bit AES encryption and declassification capabilities, has a storage capacity of as much as 256 gigabytes, reads data as fast as 240 megabytes per second, and writes data as

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new PRODUCTS



fast as 215 megabytes per second. The XPort6192 can provide a migration path from the X-ES XPort6191, in that both solid-state drives can be housed by the XPort6170 (3U VPX carrier) or the XPand3200/XPand4200 (one-half ATR chassis), company officials say. XPort6192 features include: a small form factor that fits within a standard 3U 0.8-inch pitch slot; SLC NAND flash technology; AES 256-bit encryption (optional); ATA secure erase support; declassification (enhanced erase) support (optional); operating temperature range of -40 to 85 degrees Celsius; 100,000 program/erase cycles; global wear leveling support for added memory endurance; high-reliability connector supporting 100,000 insertions/extractions; and 36 connector key options.

FOR MORE INFORMATION visit X-ES online at www.xes-inc.com.

EMBEDDED COMPUTING

Rugged 6U VPX single-board computer for radar, sonar, and video processing introduced by Aitech

Aitech Defense Systems Inc. in Chatsworth, Calif., is introducing the Freescale MPC 8640D processor-based C110 6U VPX single-board computer for harsh-environment aerospace and defense applications, such as radar system boot computers, sonar processing, video and



graphics engines, and single-board process and machine-control applications. The CPU board enables systems designers to choose between PCI Express or Serial Rapid IO (SRIO) switch fabrics, as well as to choose among several on-board I/O ports. Using an integrated dual core PowerPC processor, the single-slot C110 combines low-power performance with increased memory capabilities, withstands extreme military shock and vibration, and operates in temperatures from -55 to 85 degrees Celsius. Thermal management moves heat across the board and rejects the heat from the card edges in conduction- or convection-cooled applications. The computer board is built to OpenVPX (VITA 65) and VPX (VITA 46.0) specifications, and works in legacy VME operations, such as VME64 per VITA 46.1, while supporting advanced VME protocols, including 2eSST and 2eVME. Four x4 ports, are configurable to either Serial RapidIO (SRIO) or PCI Express (PCI Express). Via the I2C bus, the VPX connectors also provide system-level management monitoring of the board's status, including monitoring key rail voltages and temperatures. Real-time operating systems (RTOS) support includes Wind River VxWorks, Green Hills Integrity, and Linux.

FOR MORE INFORMATION visit Aitech online at www.rugged.com.

EMBEDDED SERVERS

OpenVPX embedded server with two quad-core Xeon processors introduced by Mercury

Mercury Computer Systems Inc. in Chelmsford, Mass., is introducing the rugged OpenVPX Ensemble 60000 HDS6600 quad-core, fabric-enabled Xeon-based embedded server for

military applications in radar processing, as well as intelligence, surveillance, and reconnaissance (ISR). The 6U VPX-based embedded computing server module combines the Intel Xeon processor family with the Mercury Protocol Offload Engine Technology (POET) switch fabric interconnect for on-board exploitation,



high-end radar, and multi-sensor electro-optics and infrared (EO/IR) sensor-processing. In addition to eight cores of Xeon processing, the board also has 12 gigabytes of DRAM solid-state memory on board. "We are targeting computationally intensive applications like high-end radar, EO/IR, and persistent surveillance," says Shaun McQuaid, senior product manager at Mercury. "We use the expansion plane of the OpenVPX architecture so users can connect to a GPU board for persistent surveillance algorithms." He says on-board memory could double to 24 gigabytes sometime next year. The module features: 110 billion floating-point operations per second (GFLOPS) of peak performance; two land grid array (LGA)-packaged processors on a rugged embedded platform; an expansion plane that provides a connection to a graphics processing unit (GPU) board; and open standards-based MultiCore Plus Software Development environment support. It is now available in rugged air-cooled and conduction-cooled versions.

FOR MORE INFORMATION visit Mercury Computer Systems at www.mc.com.

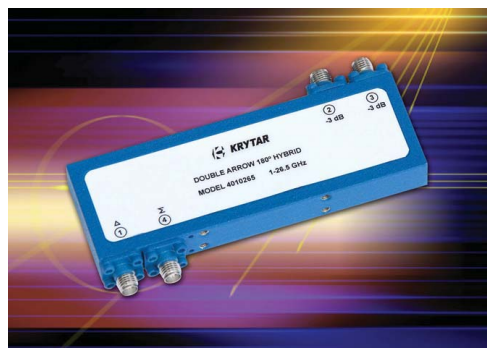
new PRODUCTS



RF AND MICROWAVE

Microwave hybrid coupler covering 1 to 26.5 GHz for antenna beamforming networks introduced by Krytar

Krytar Inc. in Sunnyvale, Calif., is introducing the Model 4010265 compact 180-degree microwave hybrid coupler that delivers 3 dB of coupling over the frequency



range of 1 to 26.5 GHz for splitting and combining signals in amplifiers, switching circuits, and antenna beamforming networks in military and commercial applications. The hybrid coupler lends itself to emerging wireless broadband designs and many test and measurement applications. Typical specifications include amplitude imbalance: plus-or-minus 1.0 dB from 1-20 GHz and plus-or-minus 1.5 dB from 20 to 26.5 GHz; phase imbalance is plus-or-minus 16 degrees; isolation is >15 dB; maximum VSWR: 1.8 from 1 to 20 GHz and 1.95 from 20 to 26.5 GHz; and insertion loss is 3.0 dB from 1 to 20 GHz and 3.6 dB from 20 to 26.5 GHz. The coupler handles 20 watts of average power and 3 kilowatts of peak power. This compact couplers measure 4 by 1.35 by 0.52 inches, and weigh 4.6 ounces. SMA female connectors are standard, and N-type female connectors are optional. The couplers are designed for

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use in operating temperatures from -54 to 85 degrees Celsius.

FOR MORE INFORMATION visit Krytar online at www.krytar.com.

CHASSIS AND ENCLOSURES

Table-top electronics rack cabinets in 3U-15 heights introduced by Elma

Elma Electronic Inc. in Fremont, Calif., is introducing the Type 38 electronic packaging desktop cabinets in 3U-15 heights designed to IEC 60297 dimensions. With an extrusion-based modular aluminum frame, these enclosures and chassis can be configured to an engineer's specifications. Optional angle brackets and shelves can be mounted at 1U height increments to provide additional support. The electronics cabinets are rated to support loads of 60 pounds per rail pair. The top and bottom covers are

folded-over on the edges, providing an aesthetic round-appeared appearance while



improving electromagnetic compatibility. Depths for the enclosures are 320, 420, 520, and 620 millimeters standard. The panels of the case are hot-galvanized powder-coated steel. The desktop cabinets also have optional ergonomic carry handles that are recessed in the enclosure side panels so that they do not protrude. Other options include feet, mounting kits, perforated panels, and more. Custom design and powder-coat colors are available. ←

FOR MORE INFORMATION visit Elma Electronic online at www.elma.com.

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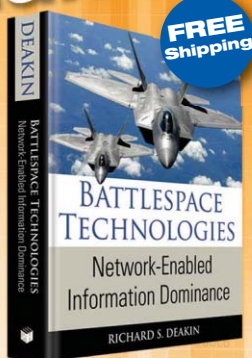
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Avionics Intelligence

Unmanned air ship from Northrop Grumman meets major milestones

Northrop Grumman's Long Endurance Multi-Intelligence Vehicle (LEMV) program team has completed three important program milestones: system readiness review (SRR), initial baseline review (IBR), and preliminary design review (PDR). The program goals were achieved four months after signing a \$517 million agreement with the U.S. Army to build three airships with 21-day persistent intelligence, surveillance, and reconnaissance (ISR) capability.

The SRR, IBR, and PDR look at the hybrid air vehicle design, ground station infrastructure, and ground and airborne system software," says Alan

Metzger, Northrop Grumman vice president and integrated program team leader of LEMV and airship programs. The team is headed toward its fourth, the Critical Design Review (CDR), by spring 2011. <http://bit.ly/dAjBcA>



Defense Executive

Microelectronics thermal management is aim of DARPA NJTT program

Microelectronics experts at the U.S. Defense Advanced Research Projects Agency (DARPA) in Arlington, Va., are asking industry for ideas on how to provide electronics thermal management for modern microelectronics—particularly gallium nitride power amplifiers—for which traditional conduction cooling, heat spreading, and convection cooling techniques are not effective.

The DARPA Microsystems Technology Office (MTO) issued a broad agency announcement (DARPA-BAA-11-09) for the Near Junction Thermal Transport (NJTT) electronics cooling program for advanced thermal management in high-power microelectronics. The NJTT program aims at crafting effective near-junction thermal management in high-power semiconductors by improving thermal transport in semiconductor structures like wide-band-gap gallium nitride (GaN) power amplifiers. <http://bit.ly/dCIQwl>

Mil-aero Blog

U.S. defense officials may be getting serious about crafting defenses against EMP attack

Scientists at the Army Research Lab are looking for companies with know-how and experience in shielding against the effects of electromagnetic pulse (EMP). The specter of an EMP attack is a scary one. EMP is among the effects of a nuclear explosion, and would cause devastating power surges in the electric power grids, automobiles, computers, and modern electric appliances that could shut the power off in large areas for long periods.

I'm heartened to see the military putting effort and money into finding ways to defend against EMP. It's long past time that the U.S. military and industry should start taking the EMP threat seriously. <http://bit.ly/bqCskR>

Command Post Community

C4ISR capability relies on embedded computers

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